

A Revision of the Lysiopetalidæ, a family of Chilognath Myriopoda, with a notice of the genus Cambalæ. By A. S. Packard, Jr.

(Read before the American Philosophical Society, June 16, 1883.)

In the course of some studies on the cave-fauna of the United States, it became necessary in treating of the cave-inhabiting myriopods to work carefully over their structure, and as they all, with a single exception, belong to the *Lysiopetalidæ*, a revision of a group which has been hitherto much neglected, may prove of service to zoölogists.

My material mainly consists of specimens collected by myself for the Kentucky Geological Survey; also, some collected by Mr. F. G. Sanborn for the same survey. I have also been indebted to Mr. E. Burgess, Prof. C. V. Riley and U. S. Department of Agriculture, for a few specimens.

Until 1840, when Brandt described the genus *Lysiopetalum* (and its synonym *Spirostrephon*), no genus of the family, as it is now understood, existed. In his *Recueil*, p. 42, he referred some southern European species to his new genus *Lysiopetalum*, mentioning *Julus fœtidissimus* Savi as the type. On p. 90 of the same work he proposed the genus *Spirostrephon* for our more common American species, the *Julus lactarius* described by Thomas Say in 1821.

In 1845, in his classical memoir in the *Philosophical Transactions of London*, on the Myriopoda, Mr. G. Newport proposed the sub-family (with *Platops* and *Cambalæ* as generic types) *Lysiopetalinæ*, with the following brief diagnosis: *Pedes laminis mobilibus affixi*.

In 1865, in his *Myriopoda of North America*, published in the *Transactions of this Society*, Dr. H. C. Wood, Jr., recognized the family rank of the group for which he proposed the name, *Lysiopetalidæ*, with the following diagnosis: "Sterna atrophied, not coalescent with or united by suture to the scuta." The type and only genus mentioned is *Spirostrephon* (*S. lactarius*).

Mr. Ryder's paper in the *Proceedings of the U. S. National Museum*, 1880, was the first attempt to enumerate the species, and his detection and account of the genus *Zygonopus* added materially to our knowledge of the group.

The synonymy of the family will be as follows:

Family LYSIOPETALIDÆ Wood.

Lysiopetalinæ Newport, *Phil. Trans.*, xix, 278, 1845.

Lysiopetalidæ Wood, *Trans. Amer. Phil. Soc.*, xiii, 137, 1865.

Koch, *Verh. Zool.-bot. Ges. in Wien*, xvii, 1867 (*Zool. Record*, p. 194, 1868).

Ryder, *Proc. U. S. Nat. Museum*, iii, 524, 1881.

Packard, *Amer. Nat.*, xvii, 328, March, 1883.

Synopsis of the Genera.

- A. Body not setose ; antennæ long ; male legs of eighth pair not modified ; genital armature of normal proportions. *Lysiopetalum* Brandt.
 Male legs of eighth pair modified, six jointed ; genital armature small
Pseudotremia Cope.
- B. Body setose.
 Body short and thick, eyes triangular ; antennæ slender ; setæ one-fifth as long as body is thick ; legs short. *Cryptotrichus* Packard.
 Body short and fusiform, eighth pair of legs of male two-jointed ; setæ half as long as body is thick *Trichopetalum* Harger.
 Body slender ; eighth pair of male legs two-jointed, ending in a claw ; setæ very long ; eyeless. *Scoterpes* Cope.
 Like *Scoterpes* ; setæ a little shorter ; sixth pair of male legs greatly swollen *Zygonopus* Ryder.

Characters of the Family. The diagnostic characters of the group, as distinguished from the Julidæ, are as follows : Head broad, wider than the body in front ; genæ much swollen, front flat ; eyes situated in a triangle, often partly or wholly aborted ; antennæ seven-jointed, much longer and more setose than in the Julidæ, especially the third and fifth joints, and also the seventh (terminal) joint. Body subfusiform, constricted behind the head, the first and second segments being much narrower than in the Julidæ. The segments usually divided into an anterior raised portion, often with longitudinal ridges, and a posterior plain depressed smaller portion ; on the sides of the anterior portion of the segments of the anterior half or two-thirds of the body a swollen boss or hump, with three setiferous tubercles ; the setæ from one-third to two-thirds as long as the body is thick. Feet very long and slender, as long as the body is thick, or sometimes longer. The coxæ contiguous, the sterna very rudimentary, not united with the scuta. In the males the sixth pair of feet enlarged and swollen (in *Zygonopus*) ; the eighth pair two-jointed and rudimentary ; number of body-segments variable ; end of body pointed.

To enter into more detail, the following comparative description of the family characters may be useful :

The Head. The head of the Lysiopetalidæ is more like that of the Polydesmidæ than the Julidæ ; the genæ are remarkably swollen, and as in the Polydesmidæ separated by suture from the rest of the epicranium ; they are higher and narrower oval than in the Polydesmidæ. The front of the head is much flattened, forming a squarish pseudo-clypeal region separated by a faint suture from the epicranium ; the sides of the head or genal region are swollen, forming a slight median depression on the vertex. The labrum is much as in the Julidæ, with three median nearly equal teeth, and with four setæ on each side as in the Julidæ. Finally, in the form and anatomy of the head, the Lysiopetalidæ approach the Polydesmidæ more closely than the Julidæ ; the nearest approach to the family in

the Polydesmidae is seen in the head of *Polydesmus ocellatus* Pack. and *P. cavicola* Pack., both American forms.

The Eyes. When well developed the eyes are equilaterally triangular, *i. e.*, the ocelli are arranged in a triangular area; in *Lysiopetalum lactarium* there are 40-41 facets arranged in rows. In *Cryptotrichus casioannulatus*, where the eye is also developed, there are about 24 facets; as several of the species inhabit caves, and suffer a partial or total loss of eyes, there is much variation in the number of ocelli; in *Pseudotremia cavernarum* the eyes are irregularly linear; the ocelli being arranged in about four irregular groups, with 11-19 ocelli, the number of ocelli varying in different individuals of the same species. In *Trichopetalum* the ocelli vary from 10-19. In *Scoterpes* and *Zygonopus* the eyes are entirely wanting. In those eyes which are partially aborted, there are a few partly developed ocelli, less than half as wide as, and scattered irregularly among, the normal ones.

The Antennæ. These are much longer and slenderer than in any Julidae, and more nearly resemble those of the Polydesmidae than the former family; but differ from both groups in the much longer terminal joint, and in the decided inequality in the relative length of the joints, the third and fourth joint being much longer than the others; the number of joints in our American species being invariably seven (not counting the basal undeveloped eminence to which the first joint is attached). The antennæ are longest and slenderest in *Pseudotremia* and *Lysiopetalum*, and shortest in *Scoterpes*, *Zygonopus* and *Trichopetalum*. The joints are more setose in *Trichopetalum*, and least so, perhaps, in *Scoterpes*. In all the genera there are from two to four flattened, enlarged, broad, fusiform tactile hairs situated on the end of the terminal joint. As observed in *Lysiopetalum* and *Pseudotremia*, these hairs are two-jointed, the basal joint short and broad; they are filled with granules like the material filling the spaces in the nervous fibres between the nerve-cells in the terminal antennal joint, which is nearly filled with nerve fibres and very small nerve-cells, showing that the antennæ must be very sensitive tactile organs, especially in the blind forms.

The Arthromeres. The body-segments of the Lysiopetalidae have a definite family form and style of ornamentation. In *Lysiopetalum* and *Pseudotremia* all the scutes are ornamented with numerous longitudinal ridges, which end in a point overhanging the depressed, flattened portion of the scute; in *Pseudotremia*, which is a modification by cave-life of the first named genus, the ridges are more or less obsolete and replaced by flattened, coarse granulations, and the lateral swellings of the scutes are well developed.

In all the other genera, the scutes are not thus ridged, and the lateral bosses or swellings are distinct; in all except *Cryptotrichus*, the bosses have three setiferous, acute tubercles arranged in an irregular triangle; in *Cryptotrichus* the tubercles are farther apart, arranged almost in a straight

line, but one situated on the boss, which is smaller than usual; the uppermost tubercle is very near the median line of the body. The setæ are straight and stiff, pointing upward and either forward or backward, and are longest in *Scoterpes*, and shortest in *Cryptotrichus* where they are minute and about one-fourth as long as the body is thick. Below and behind the lateral boss, the surface is sometimes chased with nearly parallel oblique lines, or, as in *Cryptotrichus*, the depressed hinder edge of the scutes is finely striated longitudinally. The end of the body is usually much more acutely pointed than in the *Julidæ*.

Having received, through the kindness of Dr. Latzel, specimens of *Lysiopetalum carinatum* Brandt, from Dalmatia, which is a very large species, I have been able to examine the repugnatorial pores, which are very distinct, their crateriform openings being situated each between two ridges on the anterior edge of the raised portion of the scute. In *L. illyricum* Latzel, from Austria, they are with difficulty perceived, the area in which they are situated not being discolored with yellow; but they can be detected with a half-inch objective. The two European species mentioned are provided with setæ, while our *L. lactarium* is naked. In the latter species the repugnatorial pores are situated in the middle of the yellow lateral spot, between two carinæ, which are higher and closer together than any of the others. They can be seen with a Tolles triplet.

Examining the cave Lysiopetalid, *Pseudotremia cavernarum* Cope, from Wyandotte cave, and a variety, *carterensis*, which inhabits the Carter caves, Ky., I cannot with certainty discover their site, as they are nearly, if not quite, obsolete. It is possible that in cave species, where there are apparently no enemies of these myriopods, their pores become at least externally obsolete.

The Legs. The number of joints of the legs in general is six; the second and third, especially the third, being the longest (this inequality in the length of the joints is an important family character); the fourth and fifth joints are very short, about equal in length, while the sixth and last joint is long and slender, ending in a slender claw.

Of the three pairs of primary or larval legs, the first pair are variously modified in different genera. In *Lysiopetalum lactarium* the first legs are rather flat and short; the third joint from the claw nearly thrice as long as the second, while the terminal joint is broad, with a series of close-set, stiff setæ of nearly equal length, but increasing gradually in length distally; the joint is evidently a comb-like structure adapted for cleaning the body, perhaps the mouth-parts. The first pair of legs in *Pseudotremia* are much longer and slenderer than in *Lysiopetalum*, six-jointed, and the terminal joint is less comb-like, both edges being densely setose, the inner edge, however, having the stoutest, most regular setæ.

The sixth pair of legs in *Zygonopus* are modified for clasping purposes, the fourth and fifth joints being much swollen, as described in the descrip-

tion of the genus; in all the other genera, as in all Diplopod myriopods, so far as we are aware, the sixth pair of legs are like the others.

In each genus of Lysiopetalidæ, except Lysiopetalum itself, the eighth pair of legs, *i. e.*, the pair situated on the sixth segment or that bearing the male genital armature, is much modified. In *Lysiopetalum lactarium* the seventh and eighth pair of feet, *i. e.*, those before and behind the male genital armature, are as well developed as the other legs; it is probable that, owing to the large and long genital armature, reaching beyond the basal joints of the legs, that the latter needs no change in form to assist in clasping the female. In *Pseudotremia*, however, the eighth pair of legs are much modified, though still six-jointed; the two basal joints are much swollen, of very irregular shape, the coxæ being consolidated; the rest of the leg is much smaller, slender, four-jointed, the third joint of the leg or basal joint of the free portion being as long as the three terminal joints less the long claw. In the three lower genera, *Trichopetalum*, *Scoterpes* and *Zygonopus*, the eighth pair of legs are on the same type; the two latter genera being evidently derived from the out-of-door form, *Trichopetalum*. In these three genera the eighth pair of legs are much aborted, two-jointed; the outer joint about thrice as long as the basal, and either unarmed or ending in a claw.

*The Male Genital Armature.** This apparatus has only been incidentally studied. In *Lysiopetalum lactarium* and *Pseudotremia* the *lamina externa* and *lamina interna* are much as in other Chilognaths. In the first-named genus the armature is about as large as in the Julidæ; in the *Pseudotremia* it is minute. In *Pseudotremia* and in *Scoterpes* and *Zygonopus* there is developed either upon (*Pseudotremia*) or at the base of the outer lamina a minute spinous appendage which we have not noticed in the figures of Vosges, Wood or Humbert. In each genus observed by us the armature presents characteristic features, so that they appear to have generic but no family characters. In *Scoterpes*, *Trichopetalum* and *Zygonopus* the armature is minute and rudimentary. In *Scoterpes* its outer lamina is tridentate at the enlarged end, while the inner lamina is sac-like and simple.

LYSIOPETALUM Brandt.

Julus Say, Journ. Acad. Nat. Sc., Phil., ii, part i, 104, 1821.

Lysiopetalum Brandt, Recueil, 42, 1840.

Spirostrephon Brandt, Bull. Sci. Acad., 1841. St. Pet., 1840. Recuil, p. 90, 1840.

Platops Newport, Ann. & Mag. Nat. Hist. xiii, 266, 1844.

Lysiopetalum Gervais (in part), Aptères, iv, 133, 1847.

* The genital armature of Julidæ have been described and figured by E. Voges in Zeitschrift für wissenschaftliche Zoologie, xxxi, 150, 1878. He regards the seventh segment as the "Copulationsring" of the male, and says, "at the bottom of the deep sac-like membranous connection of the sixth and seventh body-rings lies the Copulations-Organ" of the female.

Cambala Gervais, Aptères, iv, 134, 1847. Exped. à l'Amer. du Sud (Castelneau), Myriop., 17.

Reasia Sager, Proc. Acad. Nat. Sc., Phil., 109, 1856.

Spirostrephon Wood, Myriop. N. Amer., Trans. Amer. Phil. Soc., 192, 1865.

Cope, Proc. Amer. Phil. Soc., 179, 1769.

Ryder, Proc. U. S. Nat. Mus., iii, 526, 1881.

Not *Cambala* Gray, Griffiths, Cuvier, An. King. Ins., pl. 135, fig. 2, 1832.

“ *Reasia* Gray.

“ *Reasia* Jones, Todd's Cyc. Anat. Art. Myriop, 546.

Body-segments numbering as many as upwards of 60, with as many as 115 pairs of legs; the body unusually long and slender, tapering gradually towards the subacute tip. Head with the front flat, high and narrow, more so than usual; the eyes in a rectangular triangle, composed of as many as 40-41 facets, and not depressed. Antennæ rather long, the joints subclavate, joint 6 not much longer than 4; joints 3 and 5 of the same length; joint 6 rather thick at the end; joint 7 short, thick and conical, much more so than usual.

Body-segments swollen and full, becoming suddenly depressed on the front edge; the swollen portion with numerous raised lines or ridges, with deep concave valleys between; the ridges projecting behind in an acute point. The segment next to the head rather narrower than the head, with the posterior two-thirds ridged; the sides of the segments are somewhat swollen high up on the sides, but not so conspicuously as in *Pseudotremia*. Legs rather stout, and larger than in *Pseudotremia*; the first pair rather short and broad, with a regular comb of stiff setæ on the inner edge of the terminal joint. The seventh and ninth pairs of legs, *i. e.*, the pair immediately preceding and following the genital armor, are like the others, not being in any way modified as in *Pseudotremia*, etc. The genital armature is large and better developed than in any other genus of the family; the outer lamina large, stout, spatulate-mucronate at the tip; inner lamina much shorter than the outer, and with two long acute forks; repugnatorial pores difficult to find.

The genus may be recognized by the long, slender body, tapering to a point, and by the very short conical seventh antennal joint; by the ribbed swollen segments, which are very numerous; by the seventh and ninth pairs of legs being normal, like the others, and by the short, broad first pair, with the regular comb of setæ on the terminal joint.

The genus as here defined will apply to the two Southern European species *Lysiopetalum carinatum* Brandt and *L. illyricum* Latzel, except that they are setose, while our species is not. I am indebted to Dr. Latzel for specimens for comparison.

In proposing the genus *Spirostrephon*, Brandt (Bull. Sc. Acad. St. Pet., 1840), regarded Say's *Julus lactarius* as the type species, and adding that the eyes are in a triangular area, he indicates its generic difference from *Cambala annulatus*, with which it has been so often confounded.

Although I had originally retained Brandt's name *Spirostrephon* for our

species, yet upon receiving from Dr. Latzel authentic types of European *Lysiopetalum*, it is plain that our *S. lactarius* is congeneric with them. The name *Spirostrephon* should, then, be considered as a synonym of *Lysiopetalum*. It is difficult to see why Brandt should have separated *lactarius* from his *L. carinatum*.

In his *Recueil*, p. 42, Brandt thus characterizes his genus *Lysiopetalum*: *Laminae pediferæ omnes liberæ, mobiles, cutis ope cum parte abdominali corporis cingulorum conjunctæ. Frons ante antennis dilatata et deplanata in maribus in simul depressa.* The two species mentioned under the generic diagnosis are *Lysiopetalum fœtidissimum* (Savi) and *L. carinatum* Brandt.

Again, on p. 90, "Subgenus seu genus II. *Spirostrephon* Nob." is thus characterized, and he apparently regards it as a subgenus of *Julus*: *Gnathochilarii pars media fossa haud instructa, sede jus loco aream tetragonam planam, plica seu linea derata duplici, superiore brevior et inferiore longior, supra et infra terminatam, sed sutura longitudinali haud divisam offerens.* Spec. 27. *Julus (Spirostrephon) lactarius* Nob. Differt habitu a *Julis* genuinis et *Julo (Lysiopetalo)* fœtidissimo et plicato affinis apparet. *Annuli corporis, quorum posteriores brevissimi, incluso anali 53. Pedum paria 95. Longitudo 10-11^{lin}; latitudo summa $\frac{3}{4}$ ^{lin}. Oculi triangulares—Julum lactarium protypo generis Cambala Grayi habuissem, quum figura ab hocce zoologo sub nomine Cambalæ lactarii data (Griffith Anim. Kingd. Insect., pl. 135, fig. 2).* The generic characters are not very applicable in distinguishing the genus, the mention of the type alone rendering it possible to understand what the genus is.

The synonymy will be farther discussed under *Cambala*. In 1844, Newport, having been misled by the specimen of *Cambala annulata* alleged to have been sent by Say as the type of his *Julus lactarius*, places the latter in his genus *Platops*, which he proposes, with a doubt, thus: "Genus *Platops? mihi.*" The generic characters apply well to the present species, *S. lactarius*.

Dr. Wood, in his *Myriopoda of North America*, does not attempt, for want of material, to define the genus. Prof. Cope characterizes this and the next genus thus:

Annuli without pores. Spirostrephon.
Annuli with two pores on each side the median line. Pseudotremia.

As we have seen, there are pores in *Lysiopetalum*, while the "two pores" of *Pseudotremia* are two of the three setiferous tubercles on the side of each segment.

The genus appears thus far to be represented in North America by but a single species, which ranges from Massachusetts west to Iowa and south to Florida and Louisiana, while in southeastern Europe *Lysiopetalum* is rich in species.

LYSIOPETALUM LACTARIUM Say.

Julus lactarius Say, Journ. Acad. Nat. Sc. Phil., ii, part i, 104, 1821.

Spirostrephon lactarius Brandt, Bull. Sc. St. Pet., 1840; *Recueil*, 90, 1840.

- Platops lineata* Newport, Ann. Mag. Nat. Hist., xiii, 267, April 1844.
Lysiopetalum lineatum Gervais, Aptères, iv, 133, 1847.
Cambala lactarius Gervais (in part), Aptères, iv, 134, 1847.
Reasia spinosa Sager, Proc. Acad. Nat. Sc. Phil., 109, 1856.
Cambala lactaria Gervais, Exped. l'Amer. du Sud (Castelneau), Myriop. 17.
 "Reana chinosa Saeger," Gervais, Exped. l'Amer. du Sud. (Castelneau) Myriop. 14.
Spirostrephon lactarius Wood, Myriop. N. Amer., Trans. Amer. Phil. Soc., Phil., pl. ii, figs. 11, 11a, 192, 1865.
 Cope, Proc. Amer. Phil. Soc., Phil., xi, No. 82, 179, 1869. Trans. Amer. Ent. Soc., iii, 66, May, 1870.
 Ryder, Proc. U. S. Nat. Mus., iii, 526, Feb. 16, 1881.
Lysiopetalum lactarium Packard, Amer. Nat., xvii, 555, May, 1883.
 Not *Cambala lactaria* Gray, Griff., Cuvier An. King. Ins., pl. 135, fig. 2, 1832.
 Newport, Ann. Mag. Nat. Hist., xiii, 266, April, 1844.

Two ♂, two ♀. Body-segments exclusive of the head, 61, with 115 pairs of legs. Body and head horn-color, usually mottled and banded with dark blackish horn-color. The head usually with a broad, interantennal, black, conspicuous band enclosing and connecting the eyes. Eyes (compound) of 40-41 facets. Antennæ dull, blackish brown; tip of the terminal joint pale, as also the other joints at their articulation. The body with a median dull yellowish dorsal stripe, and with a lateral row of concolorous diffuse spots, one on each longest lateral ridge (the spots vary much, sometimes covering four or five ridges and extending low down on the sides of the scute. Each scute has, except those near the head and at the end of the body, about twenty-five prominent ridges, the dorsal twelve larger than those on the sides; these ridges are high, with concave valleys between them; the end of the ridges are acutely conical and project over the ends of the scutes.

Length of the entire body 35^{mm}; thickness 2^{mm}.

The above description was drawn up from the Louisiana specimens which were highly colored, banded and spotted. In the Massachusetts specimen the color is uniformly light brown, without the yellowish dorsal line and the lateral spots. The antennæ are much darker, while the legs are paler than the body. The head is much paler than the body; it is dusky on the vertex between the eyes; but there is no definite interantennal band as in the Louisiana examples.

The Iowa specimens resemble in coloration those from Louisiana, but the yellowish dorsal band and lateral spots are not quite so distinct, though the interantennal blackish band is distinct.

Massachusetts and McGregor, Iowa. Mus. Agricultural Department,

Washington, D. C. (Prof. C. V. Riley); Pilatka, Fla., and Milliken's Bend, La. (E. Burgess); "Eastern United States" (Wood); Found under bark in the mountain regions of Tennessee and North Carolina (Cope); St. Louis (Theo. Pergande).

Although this species is evidently the parent form of the cave-inhabiting *Pseudotremia cavernarum*, it has not yet been observed near the Indiana and Kentucky caves, though undoubtedly yet to be found in their vicinity, as it is a wide-spread species. It probably ranges through Central into South America, as Dr. Wood remarks: "I have seen a single specimen, a female, labeled as coming from New Grenada, which apparently belongs to this species." This specimen I have seen in the Museum of the Philadelphia Academy of Natural Sciences, but did not compare it closely with our species; it is much larger than individuals from the United States.

PSEUDOTREMIA Cope.

Pseudotremia Cope, Proc. Amer. Phil. Soc., xi, No. 82, 179, 1869. Trans. Amer. Ent. Soc., iii, 67, May, 1870.

Spirostrephon Cope, Amer. Naturalist, vi, 414, July, 1872.

Pseudotremia Harger, Amer. Journ. Sc. & Arts, iv, August, 1872.

Ryder, Proc. U. S. Nat. Mus., iii, 524, Feb. 16, 1881.

Body consisting of thirty segments; rather long and slender, with as many as fifty pairs of legs. Head with the muscular area (gena) behind the eye very full and swollen, globose, swelling out far beyond the side of the succeeding scutum; front a little longer than wide. Eyes present, black, the outline of the eye-patch narrow triangular, composed of about twelve to fifteen facets, arranged in four or five transverse oblique series. Antennæ longer and slenderer than in any of the other genera of the family; joint 3 is twice as long but not as thick as joint 2, but equals 5 in length, the latter, however, being very slender and clavate; the terminal seventh joint is unusually long, pear-shaped and elongated towards the tip.

The body constricts in a neck-like fashion behind the head; segments (scuta) 5-20 especially have a lateral shoulder or raised portion characteristic of the genus *Lysiopetalum*; this swollen portion has on each side about six longitudinal ridges, with deep valleys between; above, especially on the posterior half of the body, the dorsal portion of the laterally swollen scuta is coarsely tuberculated, instead of ridged, and the rounded tubercles are rather flat and unequal in size. There are no setæ or lateral setiferous tubercles. The end of the body is as usual in the family, the last segment with three pairs of small setæ arranged one above the other.

Above the middle of the side of the posterior scuta, especially the last six, is a tubercle like those in *Scoterpes* and *Zygonopus*, but much smaller, from which a minute hair arises, and above on the upper part of the shoulder there are two rudimentary, very small tubercles.

The legs are long and slender, about one-third longer than the diameter of the body. In the male the eighth pair of legs are much less modified

than in the succeeding genera ; it consists of five joints, while in *Trichopetalum*, *Scoterpes* and *Zygonopus* it is very rudimentary, consisting of but two joints. The basal joint is large and constricted near the middle, with a large setiferous tubercle on the inside ; the constriction may represent an obsolete articulation, and thus the basal joint really represent the two basal joints of the other legs. The smaller multiarticulate extremity of the leg is composed of four well marked joints, the basal as long as the three terminal ones without the claw, which is long and slender, and nearly as well developed as in the other legs.

The male genital armature is well developed, nearly as much so as in the *Julidæ*. There is a median very long curved forked chitinous rod, a pair of median boot-shaped pieces, and a pair of lateral double blades or pseudorhabdites, composed of the usual *lamina externa* and *lamina interna*, which are variously spined and denticulated at their extremities, one supplementary spine being minutely and densely spinulated.

The genus was characterized by Cope thus : "Annuli with two pores on each side the median line ;" as already remarked, the so-called pores appear to be simply the lateral tubercles giving rise posteriorly to minute setæ, which are difficult to detect with a half-inch objective.

The genus differs from *Lysiopetalum* in the slenderer, longer antennæ, the rudimentary eyes, the more swollen and prominent lateral bosses or shoulders of the segments, while the body has about half as many segments as in *Lysiopetalum*, and is much shorter and more fusiform. The generic characters are very marked, though the species is clearly enough derived from the common out-of-door *Lysiopetalum lactarium*.

-PSEUDOTREMIA CAVERNARUM Cope.

Pseudotremia cavernarum Cope, Proc. Amer. Phil. Soc., xi, No. 82, 179, 1869.

Trans. Amer. Ent. Soc., iii, 67, May, 1870.

Packard, Amer. Naturalist, v, 749, Dec., 1871.

Spirostrephon cavernarum Cope, Amer. Naturalist, vi, 414, July, 1872.

Spirostrephon (Pseudotremia) cavernarum Harger, Amer. Journ. Sc. and Arts, iv, 118, 119, Aug., 1872.

Pseudotremia cavernarum Ryder, Proc. U. S. Nat. Mus., iii, 526. Feb. 16, 1881.

Eyes black, conspicuous, forming a somewhat irregular, narrow triangular patch, with from twelve to fifteen facets. Antennæ unusually long and slender, the joints pilose ; joints 3 and 5 of the same length, or 3 a little longer ; joints 2 and 6 of equal length ; joint 7 elongate, pear-shaped, pilose, the extremity truncated, with two or three sense-setæ not so long as the end of the joint is thick.

The first scutum next to the head is scutellate in shape, rounded on the front edge, somewhat produced anteriorly in the middle ; the margin behind slightly sinuous ; it is about two-thirds as long as broad. The second scutum is a little wider than the first ; the third somewhat wider,

while the fourth is much wider; dorsal face of first scutum smooth; the posterior part of the second scutum a little swollen; that of the third more so; that of fourth scutum swollen and ridged much as in fifth and succeeding scuta. Scuta 5-20 are swollen high up on the sides into a shoulder, giving a quadrilateral instead of a circular outline to the segment, bulging out more subdorsally than below; the swelling has six longitudinal ridges, while the posterior swollen end of the scuta above, especially on the posterior half of the body, is coarsely tuberculated, the tubercles being rounded rather than flat, and unequal in size. No well-marked setiferous tubercles on the side from the middle of the body to the head; but on the last six segments there are on each shoulder or scutal swelling two minute rudimentary swellings or tubercles; but in my specimens I can see no setæ except on the two terminal segments of the body in ♂ and ♀, where on the end of the last scuta there is a seta arising from a basal movable joint; there are three pairs on the lateral anal plates (30th segment). Length 18^{mm}; thickness of the body 1.5^{mm}.

The young when about half-grown are white, the back of the antennæ and anterior segments having a very slight dusky tinge. In numerous mature specimens from the Senate Chamber, Wyandotte cave, three miles in, the body is white, with a slight flesh-colored tint. In numerous (150) specimens from this locality, the head and dorsal side of the anterior segments are slightly dusky; the antennæ are also usually slightly dusky, except the two terminal joints, which are white.

There is thus seen to be a slight amount of variation in color in specimens collected at the same date in the same chamber in Wyandotte cave.

Among the 150 specimens taken at one time and place from Wyandotte cave (Senate Chamber) and individually examined, I could see none without black eyes, the pigment being well developed. There was a fair proportion of males.

Four specimens which I collected in Little Wyandotte cave were exactly the same size as those from Great Wyandotte cave; they were white tinged, dusky on the head and fore part of the body. The eyes are black and the eye-patch of the same size and shape, while the antennæ are the same.

Six specimens from Bradford cave, Ind. (which is a small grotto formed by a vertical fissure in the rock, and only 300 to 400 yards deep), showed more variation than those from the two Wyandotte caves. They are of the same size and form, but slightly longer and a little slenderer, especially joints 3 and 5; joint 7 is decidedly longer than in any others; whiter, more bleached. The antennæ are much whiter than in those from the Wyandotte caves, and the head and body are paler, more bleached out than most of the Wyandotte specimens. The eyes vary more than in the Wyandotte examples, one having but 12 facets, another 14, and another 15, with a few minute rudimentary facets between the others. It thus appears that the body is most bleached and the eyes the most rudimentary in the Bradford cave, the smallest and most accessible,

and in which consequently there is the most variation in surroundings, temperature, access of light and changed condition of the air. Under such circumstances as these we should naturally expect the most variation.

Var. *carterensis*. A decided approach to *S. lactarius* is seen in certain brown specimens, only partly bleached, found in the Carter caves, Kentucky, viz. : Bat cave, X cave, and Zwingler's cave, besides a cave across the road from the hotel, which is used as an ice-house.

In the specimens from Bat cave, the antennæ are slightly shorter, and a little slenderer, particularly joints 3-5; but joint 7 is much shorter and blunter than in the Bradford cave individuals; the antennæ, however, are of the same length, though slenderer than those living in Great Wyandotte cave. The eyes form a nearly equilaterally triangular area, with from 23 to 25 facets. The segments behind the head are thirty. They differ from the Wyandotte examples in the posterior or swollen portion being rather more prominent than in the former, forming more marked lateral swellings, with about eight ridges on the side of each boss, and the body is larger and thicker, but the legs are of the same length.

The head is dark in front, mottled above and below with paler horn-color. The antennæ are concolorous with the head and body, but the terminal joints are paler, as are the legs, which are also paler at the articulations. The entire body is dark horn-brown, mottled and irregularly lineated.

The smoother anterior portion of the scuta shows a tendency to be paler than the tuberculated portion, and of a bluish-gray tint. The tubercles are no more prominent than in the Wyandotte individuals.

The segments in both the Wyandotte species and var. *carterensis* rapidly decrease in size, the penultimate segment being pointed, and each segment is provided with regular, high-raised parallel prominent ridges on the shoulder or lateral boss, about 40-45 on a scutum on the sixth segment from the end of the body.

Length 23^{mm}; thickness 2.5^{mm}, the body being considerably larger and thicker than in the Wyandotte specimens.

Two specimens from X cave are exactly in size and color like those from Bat cave.

Three specimens from the ice-house cave only differ from those in Bat cave in being somewhat paler, but the eyes and antennæ are the same.

A large and a partly grown one from Zwingler's cave was collected by Mr. Sanborn, Aug. 23; these were also paler than those from Bat cave. With them were associated a *Ceuthophilus* with eyes well developed, and *Polydesmus*.

This form or variety would be, perhaps, mistaken for *Lysiopetalum lactarium*, but it is true in all the generic details to *Pseudotremia*; at the same time it is what may be called a "twilight" species, living in small caves in situations partially lighted. It is probably derived from *L. lactarium*, or a closely allied species; we doubt if it will ever be found living in the same situations as *L. lactarium*.

Prof. Cope's types were first found by him in Erhart's cave, Montgomery county, and Spencer Run and Big Stony Creek caves, in Giles county, Pennsylvania; also, in Lost Creek cave, on the Holston river, in Granger county; and in other limestone caves of the valley of the Tennessee. Prof. Cope afterwards (Amer. Nat. vi, 14) discovered this species in Wyandotte cave, remarking, "The species is quite distinct from that of the Mammoth cave, and is the one I described some years ago from caves in Virginia and Tennessee."

CRYPTOTRICHUS,* nov. gen.

Pseudotremia Cope (in part), Proc. Amer. Phil. Soc., xi, No. 82, 180, 1869.

The head seen from in front is wider than long, as usual in the family, but the genæ (or sides above the base of the jaws) are not so much swollen as usual, being much as in *Zygonopus*; the front is broad and not very long, and is distinctly marked by a ridge from the vertex. The eyes are large, well-developed, prominent, and equilaterally triangular. The antennæ are large and slender, much more so than in *Trichopetalum* or *Scoterpes*, but not so long and slender as in *Pseudotremia*. The joints have somewhat the same proportionate length as in the latter genus, but while the second joint in *Pseudotremia* is about half as long as the third; in *Cryptotrichus* it is much longer, being about two-thirds as long as joint 3; joints 2 and 4 are of the same length, while in *Pseudotremia* joint 4 is considerably longer than joint 2; joint 5 is a little shorter than joint 3; joint 6 is very short and thick compared with that of *Pseudotremia*, being about one-third longer than thick, while in *Pseudotremia* the same joint is over twice as long as thick and regularly clavate; the terminal (seventh) joint is oval, moderately short and thick, about twice as long as thick; regularly oval, with two or three sensory flattened hairs of the usual form.

The body consists of thirty segments, including the lateral anal plates; it is thick and rather short, having the general proportions of *Trichopetalum*. The setæ being of microscopic size, the segments (scuta) appear to the naked eye to be naked and smooth; each scutum (tergite) is divided into two portions, an anterior plain and a posterior spotted portion, but there are no ridges, and but a single slightly prominent tubercle projecting backwards and situated a little below the middle of the side of the tergite; each of these tubercles, at least on the posterior half of the body, directly sends off a fine seta which is directed backwards. From each of the pale, equidistant spots, extending in a nearly straight line around the posterior edge of each scutum arises a minute hair; the same spots in front give rise to minute conical tubercles.

The legs are long and slender; as long as the body is thick.

No males have been obtained, so that the secondary sexual characters cannot be here given.

* *Κρύπτω*, I conceal; *θρίξ*, *τριχός*, hair; referring to the minute setæ, difficult to detect.

In describing *S. cæzioannulatus*, forming the type of the genus, Dr. Wood, in his "Myriopoda of North America," p. 194, remarks: "This species ought, perhaps, to be the type of a new genus; but, as I am unable to make out the generic characters in this family, it seems preferable to retain it in this for the present."

The genus may be recognized by its slender antennæ, its smooth scuta, and three transverse rows of setiferous pale dots; in these respects differing from *Lysiopetalum* and *Pseudotremia*.

CRYPTOTRICHUS CÆSIOANNULATUS (Wood).

Spirostrephon cæzioannulatus Wood, Myr. N. Amer., 194, Pl. ii, Fig. 14, 1865.

Pseudotremia vudii Cope, Proc. Amer. Phil. Soc., xi, No. 82, 180, 1869.

Two ♀. Eyes equilaterally triangular, convex, prominent, black. Body horn-brown in color, stained and spotted with darker brown. Head and antennæ concolorous, being dark purplish-brown; antennæ pale at the articulations of the joints. Feet slightly paler than the antennæ, whitish at the articulations. Segments (scuta) dark brown on the posterior edge, with three pale rounded distinct spots on each side, and a fourth spot below, or eight in all; from the centre of these three upper spots, on each side, arise short microscopic setæ. A median pale dorsal impressed line along the whole body, which dilates on the anterior part of each segment into a short, broad diamond-shaped area. The extreme hinder edge is smooth and pale, giving a transversely-banded appearance to the body. In one of the two specimens the lower white dots are, towards the head, more or less confluent, forming an irregular lunate spot. Length 15^{mm}.

Two ♀ specimens were kindly collected for me by Mr. C. L. Herrick, either at Culmana, Ala., or at Ocean Springs, Miss., the bottle containing Myriopods from both those localities. Dr. Wood's specimens were from Allegheny county, Penna.; and Prof. Cope's examples were from Pennsylvania.

This is a rather characteristic form, owing to the transverse series of light dots, and the linear pale transverse line on the hinder edge of each segment, so that the specific name is well chosen. What Dr. Wood is disposed to regard as "pores," appear to be slight tubercles, bearing setæ on the posterior half of the body. I have been thus far unable, with a half-inch objective to detect any repugnatorial pores in this genus or any except *Lysiopetalum*, but am not disposed to deny their existence. The hairs are minute and mostly rubbed off in alcoholic specimens which have been transported far. My specimens agree so well with Prof. Cope's description that I do not doubt but that his *Pseudotremia vudii* is this species. There seem to be no difference of importance. The dorsal impressed line in my specimens is a faint crease, being neither a "keel" or "groove." Cope remarks that it has twenty-nine segments; his specimen was eleven lines in length.

This Myriopod is a rather characteristic form, and appears to range from Pennsylvania to the Gulf States.

TRICHOPETALUM Harger.

Trichopetalum Harger, Amer. Jour. Sc. Arts, iv, 118, 119, Aug., 1872.

Body rather short and thick, fusiform compared with the succeeding genera, being thicker in the middle and tapering more towards each extremity than in *Scoterpes* and *Zygonopus*. Head of the general shape of that of *Zygonopus*, the proportions of the front and vertex being about the same; but the gena is much fuller, more globose, and the genal area is shorter and rounder. The eyes are present, black, the facets 10-19 in number, arranged in two curvilinear series, the eye-patch being lunate in shape. The antennæ are short and thick, much more so than in *Scoterpes*, pilose, with a few rather coarser setæ than usual; joint 2 is but slightly more than half as long as joint 3, and rather shorter than joint 4; joint 3 is considerably longer than joint 5, the latter being thick, subpyriform and swollen toward the end; joint 6 is much swollen and rounded, and about as thick as long; the seventh or terminal joint is shorter than in any other genus of the family, being rather shorter than in *Scoterpes*; and with two flattened sensory terminal setæ. Number of body segments, 28-31; number of pairs of legs in the female, 46. The legs are much shorter than in *Zygonopus*. The scutæ are posteriorly a little swollen on the sides, much less so than in the two following cave-genera; the bosses being not much over half as large; from the upper part of the boss or shoulder arise three warts or tubercles arranged as usual in a scalene triangle, and giving rise to short, rather stiff setæ, which are half as long as the segment is thick.

In the male the three pairs of legs in front of the genital armature are slightly longer than those behind or in front, but the seventh pair or that directly in front of the rudimentary eighth pair are not swollen, nor do they in any way resemble the swollen pair in *Zygonopus*. The eighth or rudimentary pair are two-jointed, the outer joint without a claw, only sending off a few small setæ.

The genital armature is somewhat similar to that of *Zygonopus*, but better developed. I could detect no lateral pores.

Mr. Harger gave the following diagnosis of the genus: "Sterna not closely united with scuta; third and fifth joints of antennæ elongated; scuta furnished with bristles; no lateral pores; eyes present." He does not attempt to give any generic characters drawn from the genitals, and in his description of *T. lunatum*, says: "The under side of the seventh segment of the male (Fig. 3) is furnished anteriorly with a pair of appendages directed backwards and curved upward," and then describes the rudimentary eighth pair of legs. Our description of the genus has been drawn up from Mr. Harger's types belonging to the Museum of Yale College, kindly loaned us for study. On such examination as we could make without dissection, the genital armature is evidently more perfectly devel-

oped than in *Zygonopus* and *Scoterpes*, but a number of specimens are needed for dissection before the structure can be clearly made out. The number of segments is 28 in *T. lunatum*; 30 in *T. iuliioides*, and 31 in *T. glomeratum*. The genus appears to be distributed from the Atlantic to the eastern slope of the Cascade mountains in Oregon, as well as on the Pacific coast of Oregon.

The following are the known species of the genus which have been described by Mr. Harger:

Trichopetalum lunatum Harger, Amer. Jour. Sc. and Arts, iv, 118, Aug., 1872.* I have found in April several specimens hibernating under leaves at Providence, R. I.

Trichopetalum glomeratum Harg., l. c., 118, 1872. Valley of the John Day river, Oregon.

Trichopetalum iuliioides Harg., l. c., 118, 1872. Simmon's harbor, North shore of Lake Superior.

Genus SCOTERPES Cope.

Spirostrephon (Pseudotremia) Pack., Amer. Naturalist, v, 748, Dec., 1871.

Scoterpes Cope, Amer. Naturalist, vi, p. 409, 414, July, 1872.

Body very long and slender, not fusiform; consisting of thirty segments besides the head, and with about fifty-two pairs of legs, with the penultimate joint very long. Head rather large, and unusually broad; no eyes present; the genæ unusually large, extending high up on the vertex, but not so globose as in *Trichopetalum*; the front is also carried farther up on the vertex than usual, and is much broader than long; the clypeus flat, slightly bilobed on the front edge. The antennæ are moderately long and hairy, with the sixth segment scarcely longer than in *Trichopetalum*, but more uniform in thickness, scarcely longer than thick; the terminal joint as long as the sixth, the end conical, more produced than in *Trichopetalum* or *Zygonopus*; at the tip are four rather long sense-setæ. Body segments becoming as usual smaller next to the head; the anterior of each division of the arthromere much swollen high up on the sides; each shoulder with three tubercles, which are arranged in a scalene triangle and bearing much longer setæ than in the other genera, though not quite so long as the body is thick. The legs are long and slender, much more so than in *Trichopetalum*, and somewhat more so than in *Zygonopus*. In the male the eighth pair of legs are rudimentary, being two-jointed, the second joint only one-fourth longer than the basal, and ending in a well-developed stout claw. The genital armature minute and very rudimentary, pale, scarcely chitinous; the outer lamina short and thick, with a stout external recurved spine, and two terminal obtuse points; the inner lamina shorter, forming a truncated angular spine, and not much more than half as long as the outer lamina; between the inner and outer lamina, its base next to the inner lamina is a middle spine ending in an irregular tuft of fine spinules.

* Author's extras, published July 13, 1872, New Haven, Conn.

The genus is distinguished from *Trichopetalum* by its want of eyes, its broader head, its long slender body, with long setæ, by the eighth pair of female rudimentary legs ending in a claw. From *Zygonopus* it differs in the shorter sixth antennal joint; its broader head; its slenderer legs, the sixth pair in the female not being unlike the others, and by the more prominent shoulders and longer setæ. The species of the two genera are of the same general form and size.

The genus *Scoterpes* was proposed by Prof. Cope for the present species in the *American Naturalist* for July, 1872, p. 414. The characters given are the "lack of eyes and of lateral pores;" the absence of the latter having been "asserted by Dr. Packard." Ignorant of the difference between the Mammoth cave blind Myriopod and *Lysiopetalum*, the latter being the only genus of the family then known, we referred it to that genus (*Spirostrephon*).

SCOTERPES COPEI Cope.

Spirostrephon (*Pseudotremia*) *copei* Packard, Amer. Nat., v, 748, Dec., 1871.

Scoterpes copei Cope, Amer. Nat., vi, 414, July, 1872.

Spirostrephon copei Harger, Amer. Journ. Sc., iv, Aug., 1872.

Packard, Zoölogy, Edit. 1-3, 1879-81.

About 20 ♂ and ♀ examined. Body white, with no dusky discolorations; 30 segments besides the head in specimens 11^{mm} in length and 52 pairs of legs; in one female individual 8^{mm} long there were 49 pairs of legs, including the eighth or rudimentary pair; in other individuals 6^{mm} long there are 24 segments behind the head. The head is provided with short, fine erect hairs of different lengths, especially on the sides of the genæ. In the absence of a second species, we cannot distinguish all the specific from the generic characters; for minor specific characters the reader is referred to figures to be hereafter published by the Geological Survey of Kentucky.

The males and females are alike in size and form.

The specimens were most abundant in the Labyrinth in Mammoth cave, but also occurred in other localities in the cave. It is also common in Diamond cave, where I collected it, and was discovered by Mr. Sanborn in Poynter's cave, 300 yards from daylight. In one of the specimens from the last-mentioned cave, the antennæ were rather more slender than usual.

The genus *Scoterpes*, and its single species *copei*, appears to be limited to Mammoth cave and the others near, in apparently the same system of caves. It was erroneously reported by me to occur in Weyer's and the Luray caves, as the specimens collected belong to *Zygonopus whitei*. Without doubt the genus is a modified *Trichopetalum*, which has become longer and slenderer in body, with longer legs and antennæ as well as setæ; whether it is a descendant of *Trichopetalum lunatum* or not is uncertain; it may have descended from a different species; but there seems

to be no reasonable doubt but that it is a modified form of a small hairy Lysiopetaloid form, with antennæ exactly like those of *Trichopetalum*.

ZYGONOPUS Ryder.

Zygonopus Ryder, Proc. U. S. Nat. Mus., iii, 527, Feb. 16, 1881.

Body rather slenderer than in *Scoterpes*. The head differs from *Scoterpes* in being much narrower and higher, the swollen sides or genæ being much less swollen; the vertex is swollen; the front as broad as long with the upper edge a little hollowed, but quite distinct from the vertex itself. The eyes entirely wanting, as in *Scoterpes*. The antennæ are rather thick, and in this respect approach *Scoterpes*, but the sixth and seventh joints are much longer, and rather more setose; the sixth joint is about two-thirds as thick as long, and the last (seventh) joint nearly twice as long as thick. The sides of the segments are swollen subdorsally as in *Scoterpes*, and the setiferous tubercles are arranged as in that genus, but the setæ are shorter; the lower posterior edges of the arthromeres below the shoulder or hump is chased obliquely with fine impressed lines. The feet are less in number than in *Scoterpes*. The diagnostic characters of the genus lie in the remarkably swollen sixth pair of feet of the male, in which the second joint is rather thick, while the third joint is long, and with the fourth joint remarkably swollen, with a series of about nine oblique retractor muscles diverging from the proximal end of the terminal joint, which is long and slender and straight, with a well-developed claw. The seventh pair of the male are of the normal form. The rudimentary or eighth pair are like those of *Trichopetalum*, the second (terminal) joint not ending in a claw, thus differing from those of *Scoterpes*. The male genital armature is entirely unlike that of *Scoterpes*, though it is rudimentary and minute; the outer lamina consists of a basal subtriangular portion, ending in a long slender curved spine, beneath which is a stouter spine, shorter and less curved; a minute median setose lamina is present, while the inner lamina is a weak, slender setose filamentary outgrowth.

Mr. Ryder's generic characters are stated very briefly, as follows: "Sixth pair of legs very robust, and with the third joint greatly swollen." The generic characters are not contrasted with those of *Scoterpes*.

This genus differs from *Scoterpes* in the remarkably swollen, clasping sixth pair of legs, and in the male genital armature, while either sex differs from *Scoterpes* in the much narrower head, and longer sixth and seventh antennal joints.

ZYGONOPUS WHITEI Ryder.

Spirostrephon copei Pack., Amer. Nat., xv, 231, March, 1881.

Zygonopus whitei Ryder, Proc. U. S. Nat. Mus., iii, p. 527, Feb. 16, 1881.

Eight ♂, 10 ♀. Body white, long and slender, number of segments 32. Head with scattered, fine setæ; antennæ with the second joint not quite one-half as long as the third, which about equals the fifth in length, both

being rather long; the sixth is thick, barrel-shaped, not quite one-half as long as the fifth, but scarcely thicker; the seventh joint is unusually long, a little more than three-fourths as long as the sixth joint; the end thick and well rounded, with the usual tactile large flattened setæ; the 3-7th joints with long dense setæ, a few in the end of joint 5 longer than any on joints 6 and 7. The setæ on the body arise from tubercles arranged as usual in a scalene triangle, and the setæ themselves are half as long as the body is thick; they are considerably shorter and finer than in *Scoterpes*.

The number of pairs of legs in the male is 47 in a specimen 8^{mm} in length, in the female there are 48 pairs. The sixth pair of legs of the male are somewhat longer and much swollen, the suture between joints 3 and 4 is very slight, the two joints together forming an ovate section of the leg a little thicker than the length of the second joint; terminal joint long and slender, considerably longer than joints 3 and 4 together. The 2-jointed eighth rudimentary pair of legs are longer and larger than in *Scoterpes copei*, the basal joint nearly twice as long, while the second (terminal) joint is larger and swollen, and besides being larger, ends in three or four fine minute setæ, instead of a short claw, as in *Scoterpes*. Length 8^{mm}.

The male genital armature is very minute and rudimentary, and has already been described in a general way; with but one species as yet known, it would be unsafe to assign their specific characters. The two inner laminae are quite unequal in length and development, and the armature in general shows signs of degeneration, as though the species had originated from some form in which the male armature was more completely developed. Nine specimens were found by us in New Market and Luray caves, and about twenty in Weyer's cave, Virginia; Luray cave, Virginia (Dr. C. A. White, Ryder).

This species in size and general appearance would be easily mistaken for *Scoterpes copei*, which we at first, from a too hasty examination, supposed it to be. Mr. Ryder's excellent description characterizes the species, but his figures are indifferent, the third joint of the male is much more swollen in our specimens; and the normal leg (his fig. 3) is drawn too slender, while the front of the head is not correctly rendered. In our specimens drops of a yellowish secretion were attached in alcoholic specimens to the base of many of the setæ, indicating the presence of repugnatorial glands, though no pores could be found. On breaking the body in two nearly ripe eggs occurred in June; they were rounded, oval; length about $\frac{2}{5}$ mm.

NOTE ON THE GENUS CAMBALA OF THE FAMILY JULIDÆ.

CAMBALA Gray.

Julus Say, Journ. Acad. Nat. Sc. Phil., ii, 103, 1821.

Cambala T. E. Gray, Griffith's Cuvier's An. King, xiv, Insecta, i, pl. 135, fig. 2, 2a, 2b, 2c, no descr., 1832.

Reasia R. Jones, Todd's Cyclop. Anat. Phys., Art. Myriopoda, 546.

Cambala Gervais, Newport, Annals and Mag. Nat. Hist., xiii, 266, 1844.

Aptères, iv, 137, 1847.

Spirobolus (in part) Wood, Mgr. N. Amer., 212, 1865.

Cambala Cope, Proc. Amer. Philos. Soc., xi, No. 82, 181, 1869.

The essential, diagnostic characters of this genus are the linear eyes, the long slender body, with keeled scutes; while the antennæ are short and thick, much as in *Spirobolus*.

The body consists of 59 segments; the scutes with high keel-like ridges. The eyes are arranged in a linear row of ocelli, forming a straight line situated far behind the insertion of the antennæ, next to the front edge of the first segment. The front of the head is somewhat longer than broad; the surface full and convex as in *Julus*. Antennæ are short and unusually thick, more so than in *Julus* or *Spirobolus*; 7-jointed, joint 2 a little longer and thicker than 3; fourth shorter and more clavate than third; fifth rather thicker at end than fourth, but of about the same length; sixth thicker than any of the other, about as long as fifth; seventh very short, round, no longer than broad. The feet are slender, not quite so long as the body is thick. On the fourth lower large ridge is a whitish microscopic spot, which under a half inch objective is seen to be a short acute tubercle; these are Say's "stigmata," but they occur on each segment, and are doubtless homologous with the setiferous tubercles in *Trichopetalum*, etc.

The only species known has been mistaken for *Lysiopetalum lactarium* by Newport, Gray and Gervais, hence the synonymy of the two genera is somewhat confused. Newport, adopting Mr. T. E. Gray's MS. name *Cambala*, was the first to characterize the genus, remarking, "I have derived the characters of this genus from the specimens originally sent by Say to Dr. Leach." It is probable that Say by mistake sent an example of his *Julus annulata* instead of a *L. lactarium*, as the two species would be easily confounded, although his *Julus annulatus* must have been of course familiar to him. The mistake was a natural one.

CAMBALA ANNULATA (Say) Cope.

Julus annulatus Say, Journ. Acad. Nat. Sc. Phil., ii, 103, 1821.

Cambala lactarius T. E. Gray, Griffith's Cuvier's Animal Kingdom, pl. 135, fig. 2, 2a, 2b, 2c. Insecta i, Vol. xiv, Vol. ii, 784, 1832.

Cambala lactaria Newport, Annals and Mag. Nat. Hist., xiii, 266, 1844.

Cambala lactarius Gervais, Ann. Soc. Entom. France, 1844.

Aptères, iv, 137, 1847.

* *Spirobolus annulatus* Wood, Myr. N. Amer., 212, 1865.

Cambala annulata Cope, Proc. Amer. Phil. Soc., xi, No. 82, 181, 1869.

Trans. Amer. Ent. Soc., iii, 66, May, 1870.

Body very long but blunt at the end, consisting of fifty-nine segments besides the head; eyes consisting each of six ocelli arranged in a straight line. The first segment behind the head is smooth, about half as long as wide,

evenly convex, considerably broader than the head; the three succeeding segments are of about the same length, and each are about half as long as the fifth and succeeding segments. On the first segment are about ten bead-like tubercles seen from above; on the third about eight longer tubercles can be seen from above; on the fifth and succeeding segments there are about nine dorsal and subdorsal high, prominent, thick, parallel ridges, becoming sharp behind. On the middle segments of the body about six sharp ridges with broad hollow valleys between can be seen from above. These are mounted on each side lower down by about twelve less distinct ridges, becoming towards the lower edge of the scuta less and less convex and distinct, until they are indicated by simple impressed lines. There are thus about thirty ridges in all on each scute. The segments (arthromeres) are short, and the smooth spaces between the rigid portions are very short above. The color of the body is horn-brown, the head, feet and antennæ pale flesh-colored, and there is a dark median spot on the vertex between the eyes. The ridges are darker than the rest of the body. Length 30^{mm}.

Little Wyandotte cave, Indiana; and Cave of Fountains next to Weyer's cave, Virginia (Packard), Zwingler's cave, Carter's cave, Kentucky (F. G. Sanborn). Spruce Run cave in the Kanawha river, Giles Co., Va. (Cope). One of the most abundant of the Myriopoda in the mountain region of Tennessee and North Carolina (Cope).

This species is not unfrequently found in caverns, where *L. lactarium* more rarely occurs. This well-marked species may readily be distinguished from *Lysiopetalum lactarium* by the very short, thick antennæ, linear eyes, and by the slenderer body, which, however, ends much more obtusely. We know of but one other species of Julidæ with the eyes arranged in a linear series; this is the *Trachyjulus ceylonicus* Peters of Ceylon, figured by Humbert.

The cave specimens which we have found are partially bleached, the result of probably a limited number of generations in the darkness.

On the Morphology of the Myriopoda. By A. S. Packard, Jr.

(Read before the American Philosophical Society, June 16, 1883.)

The following notes have reference to the hard parts especially of the diplopod Myriopods:

The Head. In the Chilognaths, which are the more primitive and in some respects the lowest group of the sub-class, the Pauropoda excepted, the structure of the head is on a much simpler type than in the Chilopoda.

The epicranium constitutes the larger part of the head; it may be regarded as the homologue of that of hexapodous insects. Of the clypeus of Hexapoda there is apparently no true homologue in Myriopods; in the Lysiopetalid Chilognaths there is, however, an interantennal clypeal re-